

AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated.

1-35. Withdrawn

- 1 36. (currently amended) A graphical user interface (GUI) for displaying and
2 manipulating a model of interconnected nodes for simulating fracturing and
3 faulting in a subsurface volume of the earth, comprising:
4 (a) a first module ~~for presenting~~ which presents in a portion of a computer
5 screen, a first graphical image representative of a plurality of
6 interconnected nodes of the model;
7 (b) a second module ~~for defining~~ which defines material properties of the
8 model defined by the plurality of interconnected nodes;
9 (c) a third module ~~for defining~~ which defines an initial deformation pattern
10 applied to boundaries or the substrate of said plurality of interconnected
11 nodes;
12 (d) a fourth module ~~for defining~~ which defines parameters of a simulation
13 process including a dynamic range relaxation algorithm for simulating a
14 response of said model to said initial deformation pattern.
15
- 1 37. (currently amended) The GUI of claim 36, wherein said first module ~~is capable~~
2 ~~of presenting~~ displays said first graphical image at least one of (i) a planar view,
3 (ii) a cross-sectional view, (iii) a 2D view, and (iv) a 3D view.

1 38. (original) The GUI of claim 36 further comprising the input of a random number
2 seed for the random number generator used for setting up at least one of (i) a
3 geometry of said interconnected nodes in said model, and (ii) breaking thresholds
4 associated with links between pairs of interconnected nodes in said model.
5

1 39. (currently amended) The GUI of claim 36, wherein said fourth module further
2 comprises an editor ~~for setting~~ which defines at least one of (i) a relaxation
3 threshold for said simulation, (ii) an over-relaxation factor for said simulation,
4 (iii) a maximum movement during said simulation, (iv) a time step for said
5 simulation, (v) an angular relaxation factor for said simulation, and (vi) an angular
6 over-relaxation factor for said simulation.
7

1 40. (currently amended) The GUI of claim 36, wherein said third module further
2 comprises an editor ~~for defining~~ which defines a deformation that is at least one of
3 (i) a localized extension, (ii) uniform extension, (iii) uniform compression, (iv) a
4 uniform right lateral shear, (v) a uniform left lateral shear, (vi) rotation, (vii) a
5 deformation region in areal simulation mode or on the lowest plane in 3-D
6 simulation, (viii) translation to a deformation region, and (ix) a rotation to a
7 deformation region.
8

1 41. (currently amended) The GUI of claim 36, wherein said second module further
2 comprises a material editor ~~for defining~~ which defines at least one region selected
3 from the group consisting of (i) a rock region in said model, and (ii) a salt region

4 in said model.

5

1 42. (currently amended) The GUI of claim 41, wherein the material editor further
2 ~~comprises defining~~ define, for each link associated with each pair of the plurality
3 of interconnected nodes for the at least one region, ~~properties~~ a property selected
4 from (A) an extensional breaking threshold for said link, (B) a shear breaking
5 threshold for said link, (C) a linear force constant for said link, and (D) a shear
6 force constant for said link.

7

1 43. (currently amended) The GUI of claim 36, wherein said first module further
2 comprises an editor ~~for controlling~~ which controls the display of at least one of (i)
3 faulting resulting from said simulation process, and (ii) a stress ~~stresses~~ resulting
4 from said simulation process.

5

1 44. **canceled**

2

1 45. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module
2 ~~to display~~ which displays a graphical images image of the model output after
3 simulating deformation.

4

1 46. **canceled**

2

1 47. **canceled**

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6

2

1 48. canceled

2

3 49. canceled

4

5 50. canceled

6

1 51. (currently amended) The GUI of ~~claim 50~~ claim 40 further comprising an editor
2 which, for defining deformation, restricts the motion of the cursor to the
3 coordinate system of the model.

4

1 52. canceled

2

1 53. canceled

2

1 54. canceled

2

1 55. (currently amended) The GUI of ~~claim 44~~ claim 36, wherein a module is capable
2 of controlling for controls display said of a graphical images image of a model
3 that is gridded.

4

1 56. (previously presented) The GUI of claim 55, wherein ~~a module is capable of~~
2 ~~controlling for display said graphical images of a~~ the model that is gridded as on

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7

3 at least one of (i) a triangular grid, (ii) a tetrahedral grid, (iii) a rectangular grid,
4 and (iv) a random grid.

5
1 57. (currently amended) The GUI of ~~claim 44~~ claim 36, wherein ~~a module is capable~~
2 ~~of controlling for display said graphical images of a model with~~ the nodes are
3 interconnected by at least one of (i) springs, and, (ii) beams.

4
1 58. (currently amended) The GUI of ~~claim 44~~ claim 36, wherein ~~a module is capable~~
2 ~~of controlling for display said graphical images of a model with interconnected~~
3 ~~the nodes having have~~ associated forces that are at least one of (i) normal forces,
4 (ii) shear forces, (iii) attractive forces, (iv) repulsive forces, and, (v) substrate
5 attachment forces.

6
1 59. (currently amended) The GUI of ~~claim 44~~ claim 36, wherein ~~a module is capable~~
2 ~~of controlling for display an~~ displays the initial deformation pattern.

3
1 60. (currently amended) The GUI of ~~claim 44~~ claim 36, ~~further comprising a module~~
2 wherein extensional breaking thresholds and shear breaking thresholds between
3 the interconnected nodes may be defined as statistical distributions.

4
1 61. (currently amended) The GUI of ~~claim 44~~ claim 36, ~~further comprising a module~~
2 wherein breaking thresholds between interconnected the nodes may be are defined
3 as by one of (i) a Gaussian distribution characterized by a mean value and a

4 standard deviation, and (ii) a Weibull distribution, ~~and wherein the plurality of~~
5 ~~shear breaking thresholds comprise one of a Gaussian distribution and a Weibull~~
6 ~~distribution.~~

7
1 62. (currently amended) The GUI of ~~claim 44~~ claim 36 further comprising a module
2 ~~for checking~~ which compares a distance between ~~pairs~~ a pair of said
3 interconnected nodes to a predetermined threshold and ~~adding~~ adds an additional
4 ~~nodes~~ node to a model boundaries boundary if said distance ~~exceeds a~~ exceeds the
5 predetermined threshold.

6
1 63. (currently amended) The GUI of ~~claim 44~~ claim 36 wherein a module ~~is capable~~
2 ~~of defining model preconditioning preconditions the model to increase the a~~
3 likelihood of fracturing of ~~the~~ bonds between a plurality of interconnected nodes
4 in a vicinity of specified locations.

5
1 64. (currently amended) The GUI of claim 63 wherein said preconditioning further
2 comprises reducing ~~the a~~ predetermined breakage threshold of those of said bonds
3 in the vicinity of said specified locations.

4
1 65. (previously presented) The GUI of claim 63 wherein said specified locations
2 further comprise one of (i) piecewise linear curves, and (ii) piecewise linear
3 surfaces.

1 66. canceled

2

1 67. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module
2 to display which displays fault surfaces projected on to at least one of (i) a
3 substantially planar view, (ii) a cross-sectional view, (iii) a 2D view, and (iv) a 3-
4 D view.

5

1 68. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module
2 to display which displays graphical images wherein the interconnected nodes are
3 displayed using a rendering quality dependent upon a predetermined deformation
4 size and degree.

5

1 69. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module
2 to display which displays graphical images wherein the interconnected nodes are
3 displayed dependent upon whether a predetermined deformation threshold has
4 been reached.

5

1 70. (previously presented) The GUI of claim 69 wherein said predetermined
2 deformation threshold is dependent upon at least one of (i) a specified number of
3 broken connections between nodes and (ii) a specified change in length between
4 nodes.

5

1 71. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module

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2 ~~to display which displays~~ graphical images of the a stress distribution within a
3 deformed network of said interconnected nodes.

4
1 72. (previously presented) The GUI of claim 71 wherein said stress distribution is
2 displayed using a color bar and scale, the color dependent on at least one of (i) a
3 scalar stress quantity for each node, (ii) a scalar stress quantity for each node
4 interconnection, (iii) a scalar stress quantity for a grid, and (iv) a scalar stress
5 quantity averaged over at least two grids.

6
1 73. (currently amended) The GUI of ~~claim 9~~ claim 36, further comprising a module ~~to~~
2 ~~display which displays~~ graphical images of deformation as an animation series.

3
1 74. (currently amended) The GUI of ~~claim 44~~ claim 36, further comprising a module
2 ~~to display which displays~~ imported graphical images superimposed with said
3 model of a plurality of interconnected nodes ~~for simulating to illustrate~~ fracturing
4 and faulting in a subsurface volume of the earth.

5
1 75. (previously presented) The GUI of claim 74 wherein said imported images ~~may~~
2 ~~be one~~ are selected from the group consisting of (i) a seismic section, (ii) a
3 geologic cross section and (iii) an arbitrary earth model.

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